# MATERIAL SAFETY DATA SHEET

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**SRM Number: 2298**
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**SRM Name: Sulfur in Gasoline (High Octane)**
**Date of Issue: 30 October 2002**

## SECTION I. MATERIAL IDENTIFICATION

**Material Name:** Sulfur in Gasoline (High Octane)

**Description:** Gasoline is a mixture of volatile hydrocarbons, the major components are branched chain paraffins, cycloparaffins, and aromatics. SRM 2298 is a high octane unleaded motor gasoline with a known mass fraction of sulfur. A unit of SRM 2298 consists of 5 amber ampoules, each containing approximately 20 mL of gasoline.

**Other Designations: Sulfur** (sulphur) **in Gasoline** (petrol; benzin)

| Chemical Name | Chemical Formula | CAS Registry Number |
|---|---|---|
| Gasoline (Full Range Alkylate Naphtha) | complex mixture | 064741-64-6 |
| Benzene | $C_6H_6$ | 71-43-2 * |
| Sulfur | S | 7704-34-9 ** |

**DOT Classification:** Flammable Liquid N.O.S.
ID#: 1993

**Manufacturer/Supplier:** Available from a number of suppliers

*Major hazardous carcinogenic component of gasoline.
**Certified component

## SECTION II. HAZARDOUS INGREDIENTS

| Hazardous Components | Nominal Concentration (%) | Exposure Limits and Toxicity Data |
|---|---|---|
| Gasoline | matrix | ACGIH TWA: 300 mg/kg or 900 mg/m$^3$ |
| | | OSHA TWA: 300 mg/kg or 900 mg/m$^3$ |
| | | Rat, Oral: $LD_{50}$: 13.6 g/kg |
| | | Rat, Oral: $LD_{50}$: 13 600 mg/kg |
| Benzene | <1 | ACGIH TWA (skin): 0.5 mg/kg |
| | | OSHA TWA: 1 mg/kg |
| | | Rat, Oral: $LD_{50}$: 930 mg/kg |
| | | Human, Inhalation: $LC_{LO}$: 2 mg/kg/5 min |
| | | Man, Oral: $LD_{LO}$: 50 mg/kg |
| Sulfur | <0.01 | No hazard information required due to concentration |

## SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

| Gasoline | |
|---|---|
| **Appearance and Odor:** colorless to amber volatile liquid with a distinct odor | **Freezing Point:** not available |
| **Relative Molecular Mass:** complex mixture | **Boiling Point (range):** 38 °C to 220 °C |
| **Density (water = 1):** 0.7 g/L to 0.8 g/L | **Viscosity (@ 27 °C):** not available |
| **Vapor Density (air = 1):** 2 to 5 | **Water Solubility**: insoluble |
| **Vapor Pressure:** not available | **Solvent Solubility:** soluble in absolute alcohol, ether, chloroform, and benzene |

## SECTION IV. FIRE AND EXPLOSION HAZARD DATA

**Gasoline**
**Flash Point:** -40 °C **Method Used:** CC **Autoignition Temperature:** 280 °C to 456 °C

**Flammability Limits in Air (Volume %):** **UPPER:** 7.6
**LOWER:** 1.2

**Unusual Fire and Explosion Hazards:** Gasoline is a severe fire hazard. Vapor/air mixtures are explosive. Vapors or gasses may ignite at distant ignition sources and flash back.

**Extinguishing Media:** Use regular foam or flood the area with fine water spray.

**Special Fire Procedures:** Fire fighters should wear full protective clothing and self-contained breathing apparatus (SCBA) when this material is involved in a fire. If possible, stop the product flow.

## SECTION V. REACTIVITY DATA

**Stability:** **X** **Stable** ____ **Unstable**

**Conditions to Avoid:** Protect containers from physical damage and sources of heat. **DO NOT** store in poorly ventilated areas.

**Incompatibility (Materials to Avoid):** Gasoline is incompatible with oxidizing materials.

See Section IV: *Fire and Explosion Hazard Data*

**Hazardous Decomposition or Byproducts:** Thermal decomposition of gasoline will produce oxides of carbon.

**Hazardous Polymerization:** _____ **Will Occur** **X** **Will Not Occur**

## SECTION VI. HEALTH HAZARD DATA

**Route of Entry:** **X** **Inhalation** **X** **Skin** **X** **Ingestion**

**Gasoline:** Levels of gasoline vapors between 160 μmol/mol and 270 μmol/mol may cause throat irritation within several hours. Levels reaching 2000 μmol/mol may induce mild anesthesia within 30 minutes. At higher levels, dyspnea, pulmonary edema and bronchopneumonia may develop. Gasoline may also affect the liver, kidneys, spleen, brain, myocardium, and pancreas. Death can result from respiratory or circulatory failure or ventricular fibrillation. Extremely high concentrations may cause asphyxiation.

Chronic exposures to gasoline fumes and vapors may cause headache, nausea, fatigue, weight loss, pallor, dizziness, insomnia, memory loss, nervousness, confusion, muscular weakness and cramps, peripheral neuropathy, polyneuritis, and neurasthenia. Liver and kidney damage are also possible.

Eye contact with gasoline may cause a sensation of irritation before signs such as conjunctival hypermia are visible. Skin contact with gasoline may cause irritation with erythema and pain. Prolonged or extensive skin contact may cause blistering and, in extreme cases, epidermal necrolysis. Dermatitis and defatting of the skin with drying and cracking or burns and blistering may also occur. Some individuals may develop hypersensitivity, which may, in part, be due to additives.

Ingestion of gasoline may cause irritation and burning of the gastrointestinal tract with nausea, vomiting, and diarrhea. Absorption may cause initial central nervous system stimulation followed by depression. Cardiac arrhythmias may occur. Transient liver damage is possible. Direct or indirect aspiration may cause chemical pneumonitis with pulmonary edema and hemorrhage, possibly complicated by bacterial pneumonia, and less frequently by emphysema.

**Benzene:** Concentrations of 300 μmol/mol may cause respiratory tract irritation; more severe exposures may result in pulmonary edema. Systemic effects are mainly limited to the central nervous system and depend both on exposure time and concentration. Effects may include nausea, vomiting, headache, dizziness, drowsiness, weakness, irritability, malaise, confusion, ataxia, staggering, weak, rapid pulse, chest pain and tightness with breathlessness, pallor, cyanosis of the lips and fingertips, and tinnitus. Polyneuritis may occur and there may be persistent nausea, anorexia, muscular weakness, headache, drowsiness, insomnia, and agitation. Nervous irritability and breathlessness may persist for 2 weeks to 3 weeks. A peculiar skin color and cardiac distress may persist for 4 weeks. Chromosomal damage has been found after exposure to toxic levels. Long-term exposure may cause symptoms related to the central nervous, hematopoietic, and immune systems. Early effects are vague and may include headache, light-headedness, dizziness, nausea, anorexia, abdominal discomfort, and fatigue. Sore, dry throat, weakness, lethargy, malaise, drowsiness, nervousness, and irritability have also been reported. Later, there may be dyspnea, pallor, slightly increased temperature, decreased blood pressure, rapid pulse, palpitations, and visual disturbances. Numerous case reports and series have suggested a relationship between exposure to benzene and the occurrence to various types of leukemia.

Eye contact with benzene may cause irritation. Repeated or prolonged exposure may cause conjunctivitis. Skin contact with benzene may cause irritation. Effects may include erythema, a burning sensation, and with prolonged contact, blistering and edema. Under normal conditions, significant signs of systemic toxicity are unlikely from skin contact alone due to the slow rate of absorption. Repeated or prolonged contact defats the skin and may result in dermatitis with erythema, scaling, dryness, vesiculation, and fissuring, possibly accompanied by paresthesias of the fingers which may persist several weeks after the dermatitis subsides. Peripheral neuritis has also been reported. Secondary infections may occur.

Ingestion of benzene may cause irritation and a burning sensation in the mouth, throat and stomach; hemorrhagic inflammatory lesions of the mucous membranes may occur in contact with the liquid. Signs and symptoms of systemic intoxication may include nausea, vomiting, headache, dizziness, weakness, staggering, chest pain with tightness, shallow, rapid pulse and respiration, breathlessness, pallor followed by flushing. There may be visual disturbances, tremors, convulsions, ventricular irregularities, and paralysis. Excitement, euphoria or delirium may precede weariness, fatigue, sleepiness and followed by stupor and unconsciousness, coma, and death from respiratory failure. Those who survive the central nervous system effects may develop bronchitis, pneumonia, pulmonary edema, and hemorrhage. The usual dose lethal dose in humans is 10 mL to 15 mL, but smaller amounts have been reported to cause death. A single exposure may produce long-term effects persisting up to one year.

**Medical Conditions Generally Aggravated by Exposure: Gasoline:** Alcohol may enhance the toxic effects of gasoline. Stimulants, such as epinephrine, may induce ventricular fibrillation.

**Benzene:** Benzene affects blood system disorders, immune system disorders and allergies.

**Listed as a Carcinogen/Potential Carcinogen (Gasoline and Benzene):**

| | Yes | No |
|---|---|---|
| In the National Toxicology Program (NTP) Report on Carcinogens | X | |
| In the International Agency for Research on Cancer (IARC) Monographs | X | |
| By the Occupational Safety and Health Administration (OSHA) | X | |

**EMERGENCY AND FIRST AID PROCEDURES:**

**Skin Contact:** Remove contaminated shoes and clothing. Rinse affected area with copious amounts of water for at least 15 minutes while removing contaminated clothing. Obtain medical assistance if necessary.

**Eye Contact:** Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain medical assistance if necessary.

**Inhalation:** Immediately remove victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Lay victim with head and chest lower than hips to improve drainage of fluids from the lungs. Obtain medical assistance.

**Ingestion:** If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. Obtain medical assistance if necessary.

**TARGET ORGAN(S) OF ATTACK:** **Gasoline:** blood
**Benzene:** immune system (blood) and central nervous system (CNS)

## SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

**Steps to be Taken in Case Material is Released:** Shut off sources of ignition. Stop the leak if it can be done without risk. For small spills, take up with sand or other absorbent material and place into containers for later disposal; for larger spills, dike far ahead of spill for later disposal. No smoking, flames or flares in area.

**Waste Disposal:** Follow all federal, state and local laws governing disposal.

**Handling and Storage:** Provide general and local explosion proof ventilation systems to maintain airborne concentrations below the TLV. Provide approved respiratory apparatus for non-routine or emergency use. Use an approved filter and vapor respirator when the vapor or mist concentrations are high. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas. Wash exposed skin areas several times a day with soap and warm water.

> **NOTE:** Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the lab.

The unopened ampoules should be stored under normal laboratory conditions away from direct sunlight.

## SECTION VIII. SOURCE DATA/OTHER COMMENTS

**Source:** MDL Information Systems, Inc., MSDS *Gasoline*, *Automotive*, *Unleaded,* 22 March 2001.
Exxon Company, USA, MSDS *Alkylate*, 17 August 1988.

**Disclaimer:** Physical and chemical data contained in this MSDS are provided for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references, however NIST does not certify the data on the MSDS. The certified values for this material are given only on the NIST Certificate of Analysis.